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ABSTRACT

There is an urgent need to fully realize (in the sense of comprehend) the extent to which technology and education are related in the modern world. This relatedness exists at a very deep conceptual level and its practical everyday social and educational implications have hardly begun to be realized (in the sense of being made real). Technology is the sum total of those activities which, in the aggregate, enable man to carry out almost any imaginable manipulation or modification of his external (material) or internal (behavioral) environments. The relationship of technology and education is, today, so close that in many parts of the world educational institutions are in the process of becoming little more than handmaidens of a demanding, world-wide technological master. To the extent that this tendency grows, we are faced with a closed technological-educational system whose success is not measured in terms of how it serves human need, but rather in terms of the system as an end in itself. However, the development and use of media of communications has also made information immediately available to the individual at his option. It is thus possible to restructure the educational system to make technology serve human needs, and this restructuring may best be carried out by those who have "opted out" of traditional education. (Author/JY)

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REALIZING THE RADICAL RELATEDNESS OF TECHNOLOGY AND EDUCATION

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I am speaking to you out of a deep concern over the ways in which technology and education are related in the world today. This relationship may best be described as a dynamic interaction between two extremely potent forces. The question which concerns me most is how each of these powerful forces is currently shaping the other and, in so doing, is shaping the evolving world. This is an enormously broad question of profound importance. Nevertheless, I shall attempt to cast some light upon it in this brief presentation.

My first theme is that there is an urgent need to fully realize (in the sense of comprehend) the extent to which technology and education are related in the modern world. My second theme is that this relatedness exists at a very deep conceptual level and its practical everyday social and educational implications have hardly begun to be realized (in the sense of being made real). Needless to say, these practical implications are both positive and negative - but more importantly, they are also unlimited. At present, there is great difficulty in realizing (both in the sense of comprehending and making real) the implications of this relatedness because of our severely limited conceptualizations of technology and education. These limited conceptualizations have resulted in the widespread failure of educational policy makers, practitioners, and the public at large, to grasp the truly radical implications of the relatedness of technology and education. I shall focus first on our present limited concept of technology.

The most common and most limited of the current conceptualizations

of technology is one which equates technology solely with machines. The defining attributes of this machine-centered conceptualization are efficiency and economy achieved through repetitive, standardized activities organized for the purpose of producing a standard, widely applicable result or product. When a person who adheres to this limited concept relates technology to education, he views it as a means of achieving a set of standard educational objectives via standardized techniques of instruction.

A second somewhat less limited conceptualization of technology is one in which technology is viewed as man's means of manipulating the elements of his material environment for the purpose of producing specific, consciously conceived results. When a person with this concept in mind views the relationship of technology and education, he sees little more than the use of various devices, such as film projectors, television, or the manipulation of various environmental elements such as walls, lighting and acoustics in order to achieve a set of educational results.

One reason why these conceptualizations of technology are uncomfortably limiting is their failure to take into account technologies that are neither machine-centered nor concerned solely with the manipulation of material elements of the environment. That is, they fail to make room for the newly emerging biological and behavioral technologies. But even if we enlarge the concept of technology to make room for these emerging technologies, we would only be engaging in a process of redefinition by addition. Whereas, what is urgently needed (if we are

ever to comprehend modern technology and its relationship to modern education) is to undertake a fresh approach to the definition of technology built upon that which is most basic to all extant technologies -- whether they be mechanical, electro-mechanical, electronic, biological or behavioral. What we should be striving for is, in fact, a radical redefinition of technology based on the most essential and common elements of all extant technologies.

Almost ten years ago, Walter Ong, a noted Jesuit scholar in the United States, suggested rather cryptically, that at its most fundamental and essential level "Technology has to do with the ordering of the possessions of the mind." This tantalizing insight into the essence of technology takes us a long way toward the basic understanding of technology that is lacking in the world today.

A second also cryptic, but somewhat more specific insight, which reinforces Father Ong's more general observation, is one by the author of The Meaning of Meaning, I. A. Richards, who has commented that, "A book is a machine to think with."

If the bibliophile resists thinking of a book as a machine and the scholar rejects the thought that the work of ordering and categorizing knowledge is in the same sense a technological act, then I hope that both may at least grant that those things that are commonly called machines -- such as the lever, the automobile, the computer -- may be validly described as human thought and knowledge made tangible. If one does not simply grant, but is also willing to reflect upon the validity of a broader truth hinted at by Richards and more directly

suggested by Ong, becomes clearly apparent. The first step in this realization is to grasp the idea that, even though when built, a machine is an orderly arrangement of material elements activated by the application of energy, before it could be built the machine had to have taken the form of a well-ordered set of thoughts in the mind of its inventor.

If this is so, then a book with its ordered set of pages, its ordered tables of contents and index, may, indeed, be thought of as a special type of machine, or, in Richards' words, "a machine to think with". And if one can see the truth of Richards' insight, then he may also begin to appreciate the validity of Ong's sweeping observation that in its most basic sense, "Technology has to do with the ordering of the possessions of the mind". Once we grasp and accept the idea that <u>human thought</u> -- <u>rather than physical matter</u> -- is the true <u>raw material</u> of technology, we are now in a position to grasp and explore what I have called in the title of this paper, "the radical relatedness of technology and education".

This relatedness is rooted, first and foremost, in the fact that both technology and education are uniquely human activities. (This is not to say that other animals are incapable of manipulating their environments or learning to adapt to a changing environment -- it is just that the human animal is so much more capable!) <u>Technology, it would seem, is the sum total of those activities which, in the aggregate, enable man to carry out almost any imaginable manipulation or modification of his external (material) or internal (behavioral)</u>

environments. Education is, of necessity, closely related to technology in that it is made up of those activities through which men are able to transmit to one another knowledge of how to manage and adapt to the changes within these environments. Of course, education should and must do more than this, but to the extent that it is concerned with these tasks of environmental management and adaptation, both the content and processes of education must inevitably relate to technology. This is particularly true as man's environment becomes increasingly technological. In short, the relationship of technology and education is, today, so close that in many parts of the world educational institutions are in the process of becoming little more than hand maidens of a demanding, world-wide technological master. This is readily understandable in a world in which technology keeps creating so much for us to know and our educational systems are so caught up in the task of transmitting this technologically-generated knowledge, that they are failing, among other things, to teach us that technology itself is a human-generated force. These educational systems also fail to take into account that while both technology and education are, indeed, human-generated, neither of them, today, are primarily human-centered activities. Rather, they both tend to center on the development of themselves as systems.

To the extent that this tendency grows, we are succeeding in creating a closed technological-educational system. A system which is all too capable of measuring its success in terms of how well it functions not as a means to larger human ends, but in terms of the system as

an end in itself. Let me give a concrete historical example of what I mean by this general and abstract statement.

During the early years of the industrial revolution in Great Britain and the United States, there was a great drive to educate large numbers of the population, at least to the basic level of proficiency in the fundamentals of reading, writing and computation, and to provide them while still young with what was then called "moral instruction". In order to facilitate the transmission of the learning contained in their curriculum, special buildings were built capable of containing the large numbers of learners who were to be instructed by a much smaller number of teachers. A system of instruction was developed which could be used by the teachers to instruct the learners in an orderly fashion. The system used books in which what was to be learned was, in turn, organized according to the system which the teacher was using. (Or, as was frequently the case, the teacher followed the instructional system implicit in the organization of the book.) The avowed purpose of this well-ordered system was, as we have already noted, to facilitate learning. And at first there was no question that this was indeed its stated and actual objective. One very important measure of this is the fact that in the earliest and most famous of the early mass-instructional systems (developed by Joseph Lancaster in England in 1801 and in use in North and South America, the European continent and Turkey by 1820) while instruction was conducted in groups, individual students were able to move from group to group based on their proven mastery

of the curriculum.

Gradually in these systems, this primary objective slowly became a secondary consideration. The main consideration became the maintenance and growth of the system itself. An excellent measure of this is the fact that as these systems grew, individual students were less and less frequently allowed to move ahead of their group even though they may have mastered that portion of the curriculum. An even greater measure of this is the fact that students who had not mastered a particular level of the curriculum would be indiscriminately moved ahead with the group to which they had been assigned. It is difficult to find any mass-instructional system developed during the 19th Century which did not lose sight of its original human-centered concern for the eradication of ignorance, and which did not make the concern for the continuation and growth of its own existence its primary goal. We have hear (here) the classic case of a technological undertaking which was designed with the best of possible human motivations unconsciously transmuted into a mindless ordering of lives by a mindless and eventually unproductive system. One may be tempted to say that this devolution of 19th Century mass instructional systems from their initial human-centered concerns to their eventual self-centered machinistic concerns is simply the nature of any bureaucratic-like organization.

In fact, if I read Jacques Ellul's The Technological Society correctly, I believe he is maintaining that this type of devolution is an inevitability whenever men organize their activities on any scale. However, I think it would be too bad to uncritically accept Ellul's unqualified

pessimism when it comes to the question of inevitability in technology. Therefore, let us adopt for the moment the posture of qualified optimists and take a critical yet more constructive look at the interaction of technology and education. I suggest that this look should be taken on as broad a scale as possible -- from the beginnings of mass instruction, mass production techniques to the present. If technology has to do with the ordering of the possessions of men's minds, then I maintain that such a sweeping look might suggest to us that for two centuries technology, itself, has, in fact, been a gigantic teaching machine! Were we to accept this insight, we might conclude that given the growth of the factory system, with its mass production and assembly line techniques, with its routinized use of human beings, that it taught educators more powerfully than any educational theorist could have -- those things needed to be learned by the members of an adolescent industrial society. The fact that 19th Century schooling throughout the industrialized world was a highly routinized, individual-constraining experience, is not something that can be considered as having developed independently of the industrial models that were so close at hand. Whether this is a more likely explanation of the character of 19th Century schooling than the theory that any large scale bureaucracy will inevitably take on these characteristics is difficult to prove. However, it may become a moot point if we look at more recent developments of the interaction of technology and education.

But before we do this, let me restate the case for the "teaching machine" view of 19th Century industrial technology as forcefully as I can. If

viewed as a gigantic teaching machine, the lesson taught by the 19th Century industrial technology seems to have been that the human being was not so much valuable in and of himself as he was a component within and a willing consumer of the results of industrial production. As a result, this view of the individual was mindlessly, subtly and effectively programed into both the formal and informal educational systems of the day. Too often the goal of this technologically dominated educational message became unconscious acceptance of the idea that the manipulation of man's natural resources, via technological means, was a totally desirable and unquestionable social and economic good. In time, the pervasive, persuasive teaching machine of technology began to order the possessions of men's minds so as to accept and expect that they, too, would, and indeed, should be so manipulated. Thus, a major lesson taught by 19th Century industrial technology was that if the individual wanted the benefits of modern industrialism in the form of material well-being, he would unwittingly allow his mind and behavior to be ordered in ways compatable with the technological ordering that had made industrialism work. In short, if the individual wished to benefit materially from modern industrial technology, he had no choice but to gear his life to the mass-production mass-instruction system on which the 19th Century technology was based.

Today in the second half of the 20th Century, we may observe, particularly in the more industrially advanced countries, increasing numbers of individuals who feel that there are alternatives available to them

other than the gearing of their lives to what they consider an outmoded system of production and instruction. Granted that even during the depths of individual-degrading Dickensian type of mid-19th Century industrialiam, there were individuals who "opted out" of the system, for individuality always manages to assert itself through the spirit of a few personalities. But the appearance of increasingly larger numbers of such individuals is a unique mid-20th Century phenomenon. The question of why and how this phenomenon has come about is being asked and answered by many different people in many different ways. Let us here attempt to answer it from the "technology-as-teaching-machine" point of view. We have already established that as one looks beyond the essential, mind-ordering characteristic of technology, the less essential attributes which help to define it for us at a particular point in time do, in fact, change over a period of time. This being the case, it is important for us to return to the examination of the changes that have occurred within the defining attributes of technology during this century.

We have previously noted that since the beginning of the century the attribute of behavioral modification or manipulation has been added to and has extended the definition of technology beyond its earlier, more restricted, material-based limits. We have also discovered that this extension is, through a process of implication, destroying the even earlier, even more restrictive definition of technology only in terms of machines. However, I would suggest that from the standpoint of education in general, and in particular from the viewpoint of

technology as a world-wide teaching machine, there have been even more important changes among the attributes which define technology in the third quarter of the 20th Century.

The most significant among these new defining attributes was the appearance earlier in this century of what I shall call "optionization" and "immediacy". "Optionization" made its appearance as a new attribute of technology initially among a few industries in the U.S. at the beginning of the second quarter of the 20th Century. The "attribute of immediacy" entered the scene somewhat later. Some of the earliest and most dramatic examples of the emergence of optionization came in the automotive industry in the form of a shift by auto producers and auto buyers away from the production and popularity of cars, like Henry Ford's famous -- and highly standardized -- Model T automobile, (which as Ford put it: The customer could have in any colour "as long as it's black!") toward the production and purchase of automobiles with broader and broader options, ranging from varieties and an array of performance features to the choice of almost any colour imaginable. "Immediacy" was introduced most dramatically through the development and use of media of communications that make information <u>immediately</u> available to the individual - <u>at his option</u>. Today during the third quarter of the 20th Century, "optionization" and "immediacy" have become increasingly central to the changing concept of technology. Within the world's more highly industrialized countries both "optionization" and "immediacy" have pervaded almost every area of consumer goods and services. No longer does a single

standardized product, whether it be shoes, breakfast cereals, or automobiles, satisfy consumer demands. Nor are services such as education or communication considered satisfactory unless there are a significant number of available alternatives, and unless these are available immediately. Parallel to this 20th Century shift from standardization to optionization is the somewhat less obvious but potentially more important shift from an unquestioned willingness to a determined unwillingness on the part of the individuals to gear their lives to the traditional industrial and educational systems. The most important fact about this shift -- which in the United States is currently and most significantly referred to as "opting out" -- is that it is, in fact, not a future hope, but an immediate grasping of an optional life style for large numbers of young people. The second important fact is that this option and the immediacy of its availability exists solely because of the highly productive level to which industrial technology has risen during this century.

Without having achieved this level of productivity and the concommitant level of affluence it has generated, no substantial number of people in society could "opt out" and manage to have themselves or society survive. The significance in the slang expression "opting out" is the unconscious recognition that it is the workings of modern technology itself which is teaching that it is realistically possible from an economic standpoint as well as often desirable from a purely human standpoint to "opt out" of the present system.

The giant, mindless, unconsciously programed teaching machine of modern

technology has been quietly and unconsciously at work -- teaching the young. It has been teaching them that it is possible to step outside the working world of our more advanced technological society and manage to live well enough on the material affluence which surrounds the technological mainstream. The Ellulian, or unqualified pessimist's view of this situation might well conclude that what these young people are inevitably opting for is a parasitic existence at the expense of the society's more responsible technologically engaged members. And, of course, there is always the chance that this diagnosis is correct.

But let us, for a moment longer, maintain our assumed posutre of qualified optimists and look for possible signs of other, more positive outcomes. In fact, let us go one step further in our role-playing and assume the posture of an "opt-out".

You are now the member of that small but growing group who have taken the initiative and taken for themselves the prize that the Technocrats and the Marxists have long implied they would win for the common man -- the prize of being supported by a man-made, but technologically managed system of production.

But you have not waited for the technocratic state to award you this prize. You have grasped it -- ahead of schedule, as it were -- and are confronted with the question of what you will do, now that you have it. I suggest that there is a chance that you will not begin to live in a parasitic, apathetic way -- that there is a chance that for the first time in your life you will begin to realize how much waste is

tolerated, accepted, even expected in a technologically permeated world. You find that you have time to think about this -- to reflect on it, and even to actively respond to the waste and to the social inequity implicit in that waste. In short, there is a chance that as an "opt-out" you and your fellow "opt-outs" will come to view yourselves as actively performing the function of a social conscience for those members of society who are still so directly involved in maintaining the system that they cannot, or dare not, see its faults.

There is also the chance that in performing this role as an <u>active</u> social conscience, you may find yourself reflecting on two facts of your new life:

1) That it is, in fact, modern technological society that makes your life possible and,
2) That you are one of the first few who have managed to learn the major lesson being taught by the big teaching machine -- that it is possible to maintain a socially relevant, human-centered existence in the midst of a technological society by persuasively demanding that the traditional technological system be adapted to serve the human and material needs of <u>all</u> members of society.

If you reflect upon these two facts, and wish to act, you will then be faced with the practical task of forcing the present techno-centered system of education to develop more human-centered techniques. If you don't become actively involved in this social and technological revolution, you and your fellow "opt-outs" may no longer have the option of keeping the prize you have grasped. What then can you as an "opt-out"

hope to do that is likely to keep this from happening? What can you do to protect the life which technology made it possible for you to choose, but which a self-aggrandizing technological system threatens to take from you? Let me give you some concrete examples of what is, in fact, being done today in some communities in the U.S. by some small groups of socially involved learners and teachers.

In Milwaukee, Wisconsin, students from both municipal and private schools have "opted out" of this traditional education and formed their own school. They hire their teachers, and are accepted into the best colleges.

In New York City, a school which was formed three years ago to help children who have been rejected by public education is, this year, being overwhelmed by applications from students who are performing well in the traditional system, but who feel that the system does not provide them with the type of learning options they desire. By a teaching-learning process which uses teachers, innovative teaching materials, and cooperating professionals from the community, students in this school are able to study in a completely individualized program while actually working with practicing professionals. The students in this school are paid for the work they do.

In Philadelphia, Pennsylvania, the traditional school system has developed a similar learning program as an experimental "counter-system" of education. This program, which has been highly successful, amounts to a planned revolution that may radically change existing educational practice and thought.

But let us not miss the point, the significance, and the radical justification of what is going on in these revolutionary situations: The point is that students, themselves, have generated these schools; the significance is that such student action has been prompted by the fact that, in their opinion, they were not being serviced by the traditional mass-instruction, mass production system; the justification of what is going on here is a conscious shift from the threat of the "dulling standardization" of the existing technologically-controlled system to an emphasis on the stimulating thrust of "option-ization" within an evolving technological society. Putting all this in another simpler way: Educators view technology as it has existed; students (at least some of them) see technology as it is coming to exist!

The question is, then, how can you as an educator bridge this perceptual, conceptual, generation gap?

The first thing that you must do is to become fully aware of the radical nature of the relationship between technology and education. By this I mean that you must come to realize at how fundamental a level the human-generated forces of technology and education are inextricably intertwined in the contemporary world. Having realized this, you must do what you can to make others aware of this radical relationship and aware, also, of the simple, radical truth that, at their related core, both technology and education have to do with the "ordering of the possessions of the mind". It will then be just a small step for you to see that the real educational/technological issue in the world today is how men's minds shall come to be ordered.

Shall they be ordered in such a way as to become the products of a mass-production, mass-instruction system, or shall they be ordered by an alternative system, the central purpose of which is to make the tools of educational technology readily available to each individual and provide him that most precious gift -- the time and security within which to pursue the knowledge he <u>needs</u> to function as a human being in a technological world.

The achievement of such an objective, which is nothing less than the redirection and management of present technological/educational systems to this human-centered end, is unlikely to occur given the present mindless pursuit of other system-centered ends that pervade the world today. However, if the educational potential implicit in modern technology can be consciously focused on the task of providing individuals with the means of becoming critically aware of the complex task of maintaining human-centered lives within a technological society, there is hope. If this hope seems somehow odd or incestuous -- in that it rests on employing technology to teach ourselves how to deal with technology -- we must realize that, in a most profound sense, this hope is the same that each of us asserts as he faces the task of using his mind to examine and deal with its own workings and products. My hope, then, is that it is still possible to create human-centered technologically-aided educational systems. And I rest this hope on the chance that educational practitioners, policy-makers, and the general public will begin to realize the profoundly important implications for all humanity residing in what I have termed "the radical relatedness of technology and education".

Were educational systems to be built upon the positive implications of this realization, they would of necessity be systems which centered on developing within the individual an awareness of -- and the competence and confidence to deal with -- a vast array of learning options from books and other media.

In such a human-centered educational system, students would use technological devices and behaviorally engineered learning materials to acquire a broad range of knowledge. The role of the teacher is no longer that of a human cog processing human products through the machinery of mass-produced instruction. The teacher's role now becomes more human. That is, it becomes the role of helping other human beings achieve the wisdom required to put facts and knowledge to work in maintaining a human-centered way of life.

At the heart of such human-centered system would be the central concern of making the learner aware of the dynamic competition among the teaching and learning systems, the value systems, and the ideologies that have come to characterize the technological world. Furthermore, it would show him the way this competition will unrelentingly affect his own life and the life of the society in which he exists. In other words, it would make him aware of the ways in which technology will affect the ordering of the possessions of his mind! How do we begin to build such educational systems?

The first step is the very practical one of creating "optionized" learning systems which can be used by individual learners with the confidence that what the system is advertized as teaching will, in fact,

be taught and can, in fact, be learned by them. This means that all instructional systems, materials, and equipment must be accompanied by evidence that would justify a learner's investment of time and effort in learning from a particular option. Secondly, there needs to be a very clear explication of the values which are implicitly operating with each learning option. Thirdly, there needs to be very open and very free access to this information so that teachers, students, parents and community groups and policy-makers will clearly understand the educational options that are available and how well the various learning materials, vying for the learner's attention, will meet his learning needs.

As I have indicated, attempts to create such systems are currently underway on a very small scale in the United States and other highly industrialized countries. But this does not mean that such attempts need be restricted to technologically sophisticated countries. The opportunity to create human-centered educational systems may in fact be greater in less industrialized countries, where the mass instruction/mass production mentality has not so deeply pervaded the fabric of society. Wherever these attempts are tried, they will meet with the inevitable objections that they are inefficient, in terms of the traditional attributes of a standardized mass-instruction/mass-production educational technology. But in a technological world of increasing optionization, the traditional concept of technological efficiency is -- like every other value -- now being opened to critical examination and reevaluation. I submit that the place to start such critical examination and reevaluation of all the attributes of technology -- including familiar attributes such as mechanism, efficiency and standardization as well as newer attributes of optionization

and immediacy is within that enterprise to which technology is most radically related. That radically related enterprise is education.